Operation and Maintenance Manual

Model 107C

*"Professional"**

Geiger Counter

*Reg. U.S. Pat. Off.

PRECISION RADIATION INSTRUMENTS, INC.
Los Angeles 16, California

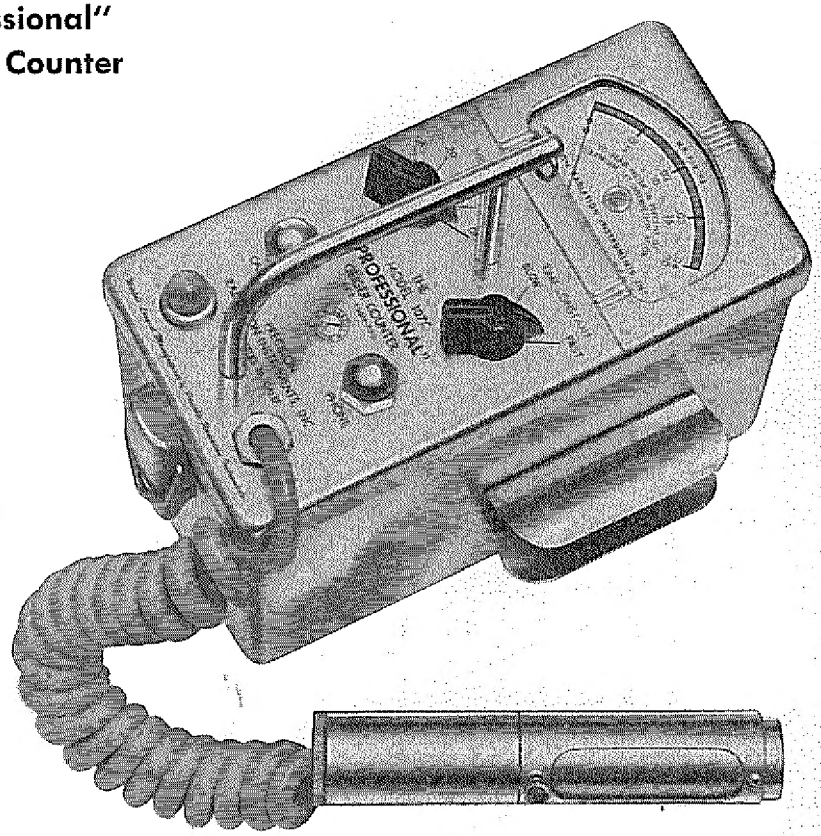
World's Largest Manufacturer of Portable Radiation Instruments

PRECISION RADIATION INSTRUMENTS, INC.

Model 107C

"Professional"

Geiger Counter



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Precision Radiation Instruments, Inc.

MODEL 107C INSTRUCTION MANUAL

I. General Description

Model 107C is a battery operated Geiger Counter. The instrument has sensitivity ranges of 20, 2.0, 0.2 and .04 milliroentgens per hour. It employs a Geiger tube as the detecting element. The presence of radioactivity is indicated by a meter, a neon light and through an earphone.

The Model 107C detects beta and gamma radiation. It is ideally suited to the prospector. A thin wall Geiger tube is mounted in a waterproof probe. This probe has a sliding shield which may be operated by loosening the knurled head screw on the probe. When the shield is closed, the instrument detects gamma rays only. With the shield open it will detect both betas and gammas. The 107C can be used in the laboratory as well as for civil defense and prospecting. In civil defense work the instrument is classed as a low level, beta-gamma survey meter.

Geiger Counters do not detect metals, minerals or any material that is not radioactive. Metal locators are required for such purposes.

The Model 107C has a calibration adjustment and is waterproof. The calibration adjustment is located on the top panel of the instrument. Supplied with the instrument is a calibrated radium disc mounted in a clip on the end of the case.

II. Definition of Terms

Certain terms are encountered in the use of radioactive materials which are peculiar to this use and which should be explained in order to make this text more understandable.

Radioactivity: The process whereby certain elements emit particles or rays due to the disintegration of the nuclei of their atoms. The main types of radioactivity are alpha particles, beta particles and gamma rays. Gamma rays penetrate matter in much the same manner as X-rays. Since gamma rays are the only type of radiation with appreciable penetrating power, they are of most importance to the prospector.

Beta particles and gamma rays are emitted in essentially equal numbers by radioactive elements. However, beta particles are so readily absorbed by rock or soil that they are of interest to the prospector only under special circumstances.

Beta particles are completely absorbed by about ⅛" of loose soil or by only 1/16" of rock, thus, only those beta particles emitted within 1/16" of the surface of an ore specimen can possibly escape from the surface to be detected by a Geiger Counter. This means that readings of beta activity measured with an open probe window are only "skin deep." Since the radiation is not usually uniformly distributed through the sample, a reading of beta radiation can give a false impression of the value of the ore.

Gamma rays have such penetrating power that their intensity at the surface of an ore sample gives a good measure of the *total* radioactive content of the sample, regardless of whether it is in a surface film or dispersed uniformly throughout the rock.

Alpha particles can be stopped by a thin sheet of paper and are, therefore, of no interest to the prospector.

Milliroentgen: the common unit of radiation intensity. This term is usually expressed with a unit of time; i.e., milliroentgens per hour (abbreviated MR/HR), and expresses the number of units of radiation intensity per hour. If a man stays twelve hours in a radiation field whose intensity is five MR/HR, he will have been exposed to 60 milliroentgens. This is the maximum amount which the A.E.C. considers to be totally harmless even when repeated day after day.

Background: a certain portion of any radioactivity measurement is not attributable to the radioactive sample being measured, but comes from other sources. This portion of the measurement is called "background." It is caused by cosmic radiation, natural radioactivity of the earth, and other sources and is present everywhere to some extent. Since background can vary greatly, it must be measured separately and be subtracted from any measurement upon which it will have an effect.

EXAMPLE:

Sample reading	.35 MR/HR
Background reading	.02 MR/HR
Corrected reading	.33 MR/HR

In order to correctly establish the background effective in the measurement of a particular sample, the sample must be moved far enough away from the instrument so that it has no effect on the background reading.

Geiger tube: The Geiger tube is a gas filled tube used as the detecting element in a Geiger Counter. The Geiger tube employed in the 107C is ¾" in diameter and about 4" long. The beta particles and gamma rays which strike it produce electrical pulses which, in turn, actuate the electric circuits and the meter of the instrument.

III. Operation and Adjustment

The presence of very small amounts of radiation can be detected by taking a measurement with a Geiger Counter. A count can be taken by counting the flashes of the neon bulb, the clicks in the earphone or by observing the meter reading in terms of MR/HR.

The instrument will normally produce clicks in the earphones at the rate of about 30 to 50 per minute. This is the normal background count caused by cosmic rays and natural radioactivity and does not indicate the presence of significant radioactivity. When unusual radio-

activity from soil or rocks is present, the number of clicks per minute will increase. A fair amount of radioactivity will cause the clicks to be as rapid as the firing of a machine gun. This can be demonstrated by bringing the sample supplied with the instrument up to the Geiger tube.

To permit accurate meter readings, the instrument is provided with four ranges of sensitivity. These ranges are selected by means of the range switch (marked MR/HR) on the panel.

There are two rows of numbers at the major scale division marks on the meter face. When the range switch is in the .04 position, read the upper row of numbers on the meter. On this range, a full-scale meter reading indicates radiation intensity of .04 MR/HR, and each major scale division is numbered to indicate directly any intensities of less than .04 MR/HR.

When the range switch is at the .20, 2.0, or 20 position, read the lower row of numbers on the meter. On the .20 range, the major scale divisions should be read as .05, .1, .15, and .2 MR/HR. On the 2.0 range, the major scale divisions should be read as .5, 1.0, 1.5 and 2.0 MR/HR. On the 20 range, the numbers are read directly: 5, 10, 15, and 20 MR/HR.

Generally, the most sensitive meter range should be used in prospecting and for low level area surveys. This is the .04 MR/HR range of the 107C. When the sample being tested causes the meter to go off scale, the switch should be changed to the next higher range. If the meter still goes off scale, switch to the next higher range, and so on.

The needle of the meter will never be perfectly still, because of the random nature of the occurrence of the radiation being measured. Sometimes the radiations arrive at equally spaced intervals, but more often they do not, and frequently occur in "bursts." The correct reading of the meter is the average of the positions occupied by the meter needle. For example, with the range switch set to 20, if the meter needle fluctuates about the center of the scale, but half the time is to

the right of the 10 mark and half the time is to the left of the 10 mark, the correct reading is 10 MR/HR.

In fields of high radioactivity, more radiations are detected per second and the meter needle will be steadier, and more accurate readings can be made. Then, readings taken on the 20 range will be steadier and more accurate than readings of very low intensity taken on the .20 range.

The following chart gives examples of correct readings of various indications on each range switch setting.

Meter Reading Chart

WHEN RANGE SWITCH POINTS TO	.20	2.0	20
And meter needle points to 5 Correct reading is	.05 MR/HR	.5 MR/HR	5 MR/HR
And meter needle points to 10 Correct reading is	.10 MR/HR	1.0 MR/HR	10 MR/HR
And meter needle points to 15 Correct reading is	.15 MR/HR	1.5 MR/HR	15 MR/HR
And meter needle points to 20 Correct reading is	.20 MR/HR	2.0 MR/HR	20 MR/HR
And meter needle points half way between 10 and 15 Correct reading is	.125 MR/HR	1.25 MR/HR	12.5 MR/HR

The .04 range reads directly as marked; thus a reading half way between .01 and .02 on this range reads .015 MR/HR.

The setting of the range switch does not affect the number of clicks heard in the phones or the number of flashes observed on the neon flasher. The individual clicks, however, are loudest on the .04 and .2 ranges. Since the intensity of radiation is greatly affected by distance between the source and the detector, samples should be brought as close as possible to the probe.

IV. Prospecting for Uranium

A very important factor in seeking radioactive minerals is to know when the instrument being used is actually giving an indication of the presence of such minerals.

The normal background reading will usually fall between .01 and .03 MR/HR, depending on location and other factors. Some prospectors adhere to the policy that any reading over normal background is good reason for further investigation of the location; such as surveying the surrounding area or taking samples from below the surface. This is good practice since a deposit may be buried under rock or soil overburden which would reduce the intensity reading at the surface or in the air above it.

There are several ways in which to search for uranium with a Geiger Counter. The method used should be chosen to fit the prospector's particular requirements.

The most direct method is to simply hold the instrument close to a sample of every type of rock encountered on a prospecting mission. The probe should not be held in a dangling position or be strapped to the leg in a vertical position. The probe should always be held parallel to the surface being worked. If any sample shows higher than normal radioactivity, then its origin should be located and more samples tested until it can be determined whether or not significant values of radioactivity are present.

As the survey is being conducted, the location where an increase

in meter reading is encountered should be noted. If possible, a survey should be made in a circle of 50 yards radius around the location. If nothing further is encountered, this would indicate that the material is in a pocket, or that the rest of the vein is covered by a large quantity of earth or rock. At this point, the prospector may dig below the surface to determine the size and value of his original find, or look further for a larger indication in another location. Care should be taken in planning surveys to make sure that as much of the area as possible is surveyed.

Samples should be collected from the area of high radioactivity and should be checked by holding them against the probe of the 107C and observing the meter reading. If the ore appears to have promise, send at least a one-pound sample to the U. S. Geological Survey, Geochemistry and Petrology Branch, Bldg. 213, Naval Gun Factory, Washington, D. C. They will assay the sample without charge and give their report only to the individual submitting the sample. If their report indicates the ore has commercial value, it should be offered to the U.S. Atomic Energy Commission, 70 Columbus Avenue, New York 23, New York, Attention: Raw Materials Operations.

The best method for locating radioactive deposits is to construct radioactivity contour maps or grids. To do this, it is necessary to systematically take readings over a large area and to record them on a map. The area to be explored should be ruled off like a checkerboard, or grid, and readings should be made at the corners of every square. In preliminary work, when it is desirable to cover the most ground in the shortest time, the squares may be made quite large, say 300 feet on a side. If, after all the readings have been mapped, there appear to be significant variations in some part of the area covered, then, in the region of interest, additional readings should be made at the center of each of the squares. This will generally produce a total set of readings from which reliable radioactivity contours (called isorads) may be drawn. The purpose in making the additional set of readings at the center of the squares formed by the first set is to obtain the

most uniform coverage, i.e., each new point is located at the maximum possible distance from all other points.

When taking readings in this manner, it is desirable to hold the instrument as high above ground as convenient so that the radioactivity from a fairly large area of ground is averaged in the measurement at each point. The choice of distance to be used between points in such a survey depends very much upon the local topography. For example, if the region is very flat with few or no outcroppings, then fairly large distances between points may be used. If, however, the terrain is very irregular, the readings should be taken at intervals close enough together to insure that at least a few readings are taken near each topographic feature. For purposes of finally determining the extent of a newly discovered radioactive ore body, readings are often taken every 10 to 20 feet.

After a satisfactory number of readings have been taken in an area and recorded in their respective locations on a map, it will generally be found that the easiest way to develop contours is to divide all the readings into three ranges, high, intermediate, and low; then, with a red pencil, circle each high value and, with a blue or green pencil, circle each low value. By holding the map at some distance from the eyes, it usually will be possible to distinguish any significant pattern that may be present.

If there are any well defined areas in which the readings are uniformly high, or in which only one figure is outstandingly high, then such areas should be investigated further by taking readings on particular samples or by making radioactivity measurements in test drill holes put down to whatever depth is practical for the area. To measure radioactivity in drill holes the Precision Radiation Model 122 Drill Hole Probe is recommended. The Model 122 can be used in conjunction with Precision Model 121 "Prober" Geiger Counter.

For additional information on prospecting, the book "PROSPECTING FOR URANIUM," can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., price 55 cents.

V. Detection Range

It is not possible to specify the distance at which a Geiger Counter will detect a deposit. This depends on many factors such as the size and quality of the deposit, the thickness and type of overburden covering the deposit, whether the overburden itself is radioactive, etc. It appears that important, though very small, traces of radioactivity are often located in the soil many yards away from, or over the actual ore body. Such traces of radioactivity produce a weak response in the counter as though the rays from the actual ore body were penetrating the intervening amount of soil or overburden. In one case, by careful measurements and the use of contour maps, a large body of uranium ore was discovered 200 feet below the surface. The radioactivity at the surface of the earth over the ore was only twice that of the surrounding area. Upon drilling a test hole down to the ore, it was found that the telltale radioactivity was located entirely in the top five or six feet of earth. At a distance of 100 feet below the surface (and 100 feet from the ore body) there was actually less radioactivity than occurred on the surface.

Experiences of this kind are common enough to say that there is no simple answer to the question, "How deep may buried ore be detected?" It can be shown that a very few feet of barren quartz or limestone can almost completely absorb the rays from a large body of uranium beneath it. But it is also true that telltale traces of uranium are often found at large distances from the parent body and these traces often enable the prospector to locate the real vein.

VI. Assaying With a Geiger Counter

There are, in general, two ways in which to determine the amount of uranium in ore. The most fundamental way is to directly measure the uranium in a sample by chemical means. Chemical assays are

essentially infallible, but they require the use of a chemical laboratory and are relatively time consuming.

The other method of assaying uranium ore is the so-called radiometric method. This method is based on the fact that nearly always, the amount of radioactivity of a sample of ore (which can be measured with a Geiger Counter) is proportional to the amount of uranium in it. There are some important exceptions to this, however. Uranium is not the only radioactive element which occurs in nature. Thorium is a radioactive metal, somewhat similar to uranium and in some regions the two metals occur in the same ores. For example, in Southern California, several deposits are known to contain both thorium and uranium. The radioactivity of such ores cannot be used as an accurate measure of the uranium content since the radioactivity of thorium cannot be easily distinguished from that of uranium. The accuracy of a radiometric assay is also sometimes influenced by the fact that the radioactivity of uranium itself — alpha particle emission — is not the kind which can be detected on Geiger Counters. However, the products of the radioactive decay of uranium are themselves radioactive and two of these, radium and radon, are actually responsible for most of the radioactivity observed in uranium ores. Because radium is chemically much different from uranium, when uranium ore is exposed to the weathering action of air and water, at the surface of the earth, the radium may be dissolved away and redeposited nearby in other rocks. Thus, samples of weathered uranium ore may exhibit higher or lower amounts of radioactivity than would be expected on the basis of their true uranium content.

In spite of these potential hazards, the method of radiometric assaying is so convenient that it is very frequently used, and a high degree of accuracy can frequently be obtained. With ores known to be "in equilibrium" and free of thorium, it is possible to predict quite accurately the amount of radioactivity associated with uranium by radiometric assaying. The following methods of radiometric assaying apply to various field situations.

Hand Specimens: For very rough estimates of assay value which can be made "on the spot," select a nearly round piece of ore weighing about ¼ pound and hold it against the 107C probe with window closed. Such a specimen will produce a reading in MR/HR which is approximately one-tenth the percentage of uranium oxide (U_3O_8) it contains. For example, a sample containing 1% U_3O_8 will give a reading of about .1 MR/HR over the normal background reading. If the specimen is not of uniform composition, several readings should be taken on different sides, and the best estimate will be the average of the readings.

Large Samples for Appraisal of New Finds: For an accurate assay with the 107C, a large sample (several pounds) should be taken from the ore body or outcrop. Such a sample must be taken so that, as far as possible, it represents a true cross-section of the ore that might actually be mined and sold. The whole sample should be pulverized and well mixed.

To determine the percent of uranium oxide contained in the sample, first set the TIME CONSTANT on the 107C to SLOW, check the CALIBRATION control setting, then:

1. Lay closed 107C probe flat on ASSAY CONTAINER cover. Probe window should be closed.
2. Take the background reading.
3. Fill container to dotted line with pulverized ore and take a second reading with the probe in the same position as in the first step.
4. Deduct the background reading from the ore reading.
5. Multiply the answer by ten for percentage of uranium oxide.

EXAMPLE:

Background reading	.01 MR/HR
Ore reading	.03 MR/HR
Difference	.02 x 10 = .2

The ore is approximately two-tenths of 1% uranium oxide.

Comparing samples: The Model 107C can be used to determine the uranium content of a piece of ore in percent of U_3O_8 by comparative methods. To do this it is necessary to obtain a sample of ore that has been assayed and has a known uranium content. Place this sample at a particular distance from the probe and observe the meter reading. Then take a sample of the ore of unknown value and place it at the same distance from the probe. If the ore is of the same physical size and shape as the assayed sample, and has the same uranium content, it will give the same reading on the meter. If it has twice the uranium content, it will give twice the reading and so forth. In order to obtain samples of the same size and shape, it is desirable to have both the known and unknown ore samples ground into a powder and placed in small bottles of equal size. If the ore in question contains thorium, the readings of the counter will represent the sum total of uranium and thorium. Typically, a pound of ore containing only 1% of uranium and no thorium will give a reading of somewhat more than .1 MR/HR when held close to the counter's sensitive area. When applying these tests, the probe window should be closed. A simple bead test can be of value in distinguishing between ores of thorium and uranium: A loop of hot platinum wire is dipped into sodium floride and then heated over a small hot flame until a bead is formed. When the bead is brought in contact with the finely ground ore sample, grains from the sample attached themselves to the bead. The bead is then reheated until the grains are melted into it. After cooling, the bead is examined under ultraviolet light. Uranium will fluoresce to a brilliant lemon yellow. If there is only thorium present, no fluorescence will be indicated on the bead.

VII. Special Factors Affecting Results

The air and all rocks and soils are radioactive to some extent. Their radioactivity arises from the presence of minute traces of relatively small numbers of radioactive elements including uranium (the radioactivity of the air is due to two gases, radon and thoron, and

traces of radioactive elements in dust). Because the radioactivity in rocks and soils is generally due to traces or "impurities," only general statements can be made concerning the amount of radioactivity associated with particular types of rock. Furthermore, since the chemical behavior of the radioactive elements is frequently different from that of the other elements with which they occur, the distribution of radioactivity in the surface layers of rocks and soil may be influenced by the presence of percolating ground waters.

In general it may be said that granite, pegmatite and shale are likely to be more radioactive than limestone, quartzite, or sandstone. But there will be many exceptions to this rule; for example, the highly radioactive carnotite is often found in sandstone.

Because of the effect of local topography (drainage ditches, rock outcrops, bogs, road cuts, etc.) on radioactivity distribution, care must be used in interpreting radioactivity readings if precise readings are desired. In areas where shale may be near or on the surface, the radioactivity will usually be high. Lakes, swamps, and rivers usually produce low values of radioactivity. The radioactivity over a fresh road cut will frequently be abnormal (either high or low). Radioactivity readings frequently show a characteristic change over faults, being higher on one side than the other.

Geiger Counters do not respond to any ore that is not radioactive. In taking readings for uranium, it should be remembered that there are other elements, notably thorium, which are also radioactive. There is no convenient way to distinguish between the readings obtained from uranium and thorium bearing ore (other than chemical analysis). Since thorium is also a valuable mineral this is not a serious disadvantage.

Prospectors are occasionally misled by the "mass effect" and believe they have found a valuable uranium deposit, when actually they are in the presence of a large body of very low grade ore which is valueless. In general, readings of several times background are

not significant unless a small sample which gives a good reading can be found either at the surface or below the surface. If good readings can be obtained in an area, but not from an individual ore sample, this indicates that either the ore body is deeply buried or that the reading is due to the "mass effect." Another situation in which "mass effect" becomes an important factor is when the probe is placed in a hole in the ground. If the soil is even slightly radioactive, the measurement taken is the total of the radiation coming from the soil all around the probe and will therefore produce a higher reading than when the probe is at the surface and is being influenced only by radioactivity coming from the surface.

Readings with the instrument will be affected by the presence of ice and snow on the ground. Ice is a particularly efficient absorber of gamma radiation. Most of the gamma rays will be absorbed by the ice if it is three or four feet thick. The extent that snow will absorb the gamma radiation depends upon the thickness of the layer of snow and how closely it is packed.

VIII. Preventive Maintenance and Field Adjustment

If the instrument is stored for long periods such as one year, the batteries should be removed. The instrument should be given the same care as would be given a portable radio and should be protected as much as possible from rough handling. No servicing should be attempted by unqualified persons except for battery replacement and setting of the calibration control. The radioactive sample disc provided with the Model 107C is calibrated. It is stamped with its value in milliroentgens. It will give a reading equal to this value when held flat against the face of the Geiger tube with the shield in the open position. The range switch should be set to the 2.0 range position. The sample should be moved along the window to the position where it gives the maximum reading. The calibration can be adjusted by removing the cap nut on the CALIBRATION control and turning the

control to the point where the meter reading is approximately equal to the value stamped on the sample. Sensitivity falls off as the batteries wear out and may be reset by adjusting the CALIBRATION control. "A" batteries should be replaced when they fall below 1.10 volts; "B" batteries should be replaced when they fall below 35 volts.

45 VOLT REPLACE 67½ VOLT BATTERIES AT 53 VOLTS.

Batteries should always be tested under load. It is therefore desirable to have the instrument turned on when battery voltages are measured. The instrument should be turned off at all times when not in use to conserve the batteries. Geiger tubes are extremely fragile and can be easily broken if improperly handled, although they will stand considerable jarring when mounted in the instrument. Geiger tubes should not be replaced or handled by other than experienced personnel.

IX. Battery Replacement

The Model 107C uses one 67½ volt "B" battery (R.C.A. type VS016 or Eveready type 467); one 45 volt "B" battery (R.C.A. type VS055 or Eveready type 455); and two flashlight batteries. The flashlight batteries should be replaced only with R.C.A. type VS036, Eveready type D99 or equivalent leakproof cells.

The batteries can be replaced by unhooking the latch fasteners at each end of the case and lifting the instrument out of the case. The "A" batteries (which should require changing about twice as often as the "B" batteries) can be replaced simply by pulling them out of their holders. To replace the "B" batteries, slide them out of their compartment and then unsnap the terminal strips. Batteries can be purchased from most radio and hardware stores, etc., and no experience is required for their replacement.

When replacing batteries, make certain that new batteries are of the types recommended in this section.

BATTERY TYPE	67½ V.	45 V.	1½ V.
Continuous Use	280 Hrs.	280 Hrs.	115 Hrs.
4 Hour Daily Use	330 Hrs.	330 Hrs.	200 Hrs.

X. Theory of Operation

The 107C contains four subminiature vacuum tubes. Two Amperex type 6007 tubes or equivalent are used in a circuit which produces the nine hundred volts necessary to operate the Geiger tube. An NE2 neon bulb operates as a relaxation oscillator to provide a basic frequency of about 150 cycles. The oscillator signal is used to "key" one of the 6007 tubes. Each time the current is cut off in the 6007 a pulse of high voltage is developed across the choke coil in its plate circuit. By means of the second 6007 tube connected as a diode, these pulses are rectified to produce the steady high voltage. An NE2 neon bulb is used in conjunction with a bleeder consisting of a string of high value resistors in an automatic voltage regulating circuit designed to conserve "B" battery current.

The third and fourth 6007 tubes are used in a biased multivibrator circuit which greatly amplifies the signals from the Geiger tube and which drives the indicating devices.

XI. Corrective Maintenance

Failures can result from the common faults of electronic circuits such as burned out resistors, shorted capacitors, etc. Standard servicing techniques may be used with one major exception. The 900 volts across the Geiger tube can be measured accurately only with an electrostatic voltmeter. Any ordinary meter, even of the vacuum tube voltmeter type, will load the circuit sufficiently to cause a drop in voltage of 100 volts or more. When replacing the power supply tubes it may be necessary to reset the high voltage. The high voltage can be

decreased by reducing the number or value of resistors in the string of high value resistors. The high voltage can be increased by adding resistance to this string.

XII. Laboratory Calibration Procedure

(For authorized service shops only)

Before calibrating, close the shield on the probe and make sure 900 to 940 volts is being obtained at the Geiger tube. Expose the probe to a source of .1 MR/HR and turn the range switch to the .20 position. Set the CALIBRATION control on the top panel to obtain a meter reading of .1 MR/HR. Then remove the instrument from its case and expose the probe to a source of 1.0 MR/HR. Turn the range switch to 2.0 and adjust the trimmer marked 2 located under the top panel to obtain a reading of 1 MR/HR. Next use a source of 10 MR/HR and turn the range switch to 20. Adjust the 20 trimmer to obtain a 10 MR/HR reading.

XIII. Guarantee and Factory Service

All parts except the batteries are guaranteed for a period of ninety days from date of purchase against defects in workmanship and material. The batteries cannot be guaranteed as they may be easily damaged by misuse. Always check the batteries before returning the instrument for service. The instrument should be returned in the original packing material or be covered on all sides with a thick layer of soft packing material.

To obtain service, pack the instrument carefully as described above, and return it insured and prepaid to your nearest Authorized Service Station. The following list of service stations is not necessarily complete as we are continually adding additional new facilities for your convenience. If you do not find a service station listed in your area, write us and we will advise you of the name of your closest factory Authorized Service Station. Enclose a note stating

exactly in what way the instrument has not been performing properly, from whom it was purchased and the date of purchase. Ship to:

P.R.I. Authorized Service Stations

ALASKA

ANCHORAGE RADIO & TELEVISION, INC.
443 Fourth Ave., Anchorage, Alaska

ARIZONA

COMMERCIAL RADIO CORP.
747 North Stone, Tucson, Arizona

VINSON-CARTER ELECTRIC CO.
325 North Fourth Street
Phoenix, Arizona

CALIFORNIA

ALAMEDA RADIO & TV CO.
612 S. Victory Boulevard
Burbank, Californina

ENGINEERS SYNDICATE, LTD.
5011 Hollywood Boulevard
Los Angeles, California

INDUSTRIAL INSTRUMENT SERVICE CO.
606 North Ventura Avenue
Ventura, California

LAIDLEY & BAMMES RADIO CO.
1280 Court Street, Redding, California

ROBERTS ELECTRIC
821 Palm Avenue
Imperial Beach, California

TELEVISION SERVICE CO.
900 Colton, Colton, California

THE ROBERT DOLLAR CO.
Marine Division
50 Drumm Street
San Francisco, California

COLORADO

G & H URANIUM
P.O. Box 1467, Durango, Colorado

GEIGER CENTER
105 East Colfax Ave., Denver, Colo.

MINERALS ENGINEERING CO.
801 Fourth Avenue
Grand Junction, Colorado

MICHIGAN

EVALUATION SALES & SERVICE
211 East Packard, Mt. Pleasant, Mich.

MISSOURI

WILSON-WILEY COMPANY
328 Richards Road, Kansas City, Mo.

NEVADA

LASSEN HOME SUPPLY
734 South Virginia St., Reno, Nevada

NEW MEXICO

SAM'S RADIO SERVICE
218 Vassar, S.E.
Albuquerque, New Mexico

P.R.I. Authorized Service Stations

NEW YORK

AUTHORIZED MANUFACTURERS SERVICE COMPANY
919 Wycoff Avenue
Brooklyn 27, New York

NORTH DAKOTA

PAT'S RADIO & ELECTRONIC SERVICE
Bowman, North Dakota

OREGON

HAWTHORNE ELECTRONICS
200 S.E. Hawthorne, Portland, Oregon

TEXAS

CONANT ELECTRONICS SPECIALTIES CO.
1801 East Mitchell St., Arlington, Texas

FONVILLE ELECTRONIC SERVICE
120 South Oak, Pecos, Texas

MUNDINE RADIO & TELEVISION SERVICE
217 East White Avenue
San Antonio, Texas

UTAH

WARREN TELEVISION & RADIO COMPANY
28 South Main Street
Salt Lake City 1, Utah

NOTES -

1. - SWITCHES SEEN FROM KNOB END. "F" AND "R" ARE FRONT AND REAR SECTIONS OF S1
2. - ALL CAPACITORS GREATER THAN 1 IN µµF, ALL LESS THAN 1 IN MFD.
3. - ONE OR MORE RESISTORS (R9, R10, R11, OR R12) MAY BE SHORTED OUT TO ADJUST HIGH VOLTAGE
4. - PIN 1 OF 6007'S IS NEAREST RED DOT

PRECISION RADIATION INSTRUMENTS, INC.
- GEIGER COUNTER -
MODEL 107C
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